

CLASS 332, MODULATORS**SECTION I - CLASS DEFINITION****A. BASIC SUBJECT MATTER OF CLASS**

This is the generic class for modulators. A modulator is a device which varies a characteristic of a repetitious electrical or electromagnetic wave of less than infrared frequency in accordance with a characteristic of an arbitrarily varying information carrying signal. Classification herein is broadly by the type of modulation exhibited by the output signal.

B. COMBINATIONS WITH BASIC SUBJECT MATTER INCLUDED IN THIS CLASS

1. A modulator combined with structure for measuring or indicating some aspect of the modulation process or characteristic of the modulated signal is classified here. Specifically, measurement or indication of a frequency or amplitude modulator is classified here.
2. A modulator combined with a specific modulating signal source (e.g., microphone or photocell) is classified here by modulation type unless provided for elsewhere.
3. A modulator combined with structure to improve the modulation is classified here. Such structure might include, for example, a particular power supply for electronic devices within the modulator or structure to correct for distortions in the modulated wave.
4. A combination including both a modulator and a demodulator is classified here where such combination is not provided for elsewhere.

C. MISCELLANEOUS SYSTEMS AND DEVICES USED WITH MODULATORS

This class also provides for (1) miscellaneous systems and devices which are not of general utility and which are limited to use with modulators and (2) miscellaneous systems and devices useful with modulators which are not otherwise classified. Examples of such subject matter are a structure limited in use to measurement of a modulated wave, a multiplex modulator where a plurality of modulating signals are imposed on a carrier or pulse wave, or a modulation converter where modulated energy of one character is converted to modulation energy of a different character (e.g., frequency modulation to amplitude modulation).

SECTION II - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS

Excluded from this class are light wave modulators which are classified elsewhere. (See References to Other Classes, below.)

Excluded from this class are pulse code modulators and delta modulators which are now classified elsewhere. (See References to Other Classes, below.)

Excluded from this class are those devices comprising an oscillator combined with or including a specific element which is merely responsive to an external physical condition (e.g., ambient temperature) and which thereby varies a parameter (e.g., amplitude or frequency) of the oscillator. Such devices are classified elsewhere. (See References to Other Classes, below.) However an oscillator in combination with significant modulating structure is classified in Class 332.

Classes 330 Amplifiers and 331 Oscillators contain subject matter directed to subcombinations potentially usable in modulators (e.g., an electrical amplifier combined with suitable gain control structure could be utilized as an amplitude modulator). Therefore, these classes should be considered in completing the search for subject matter of Class 332. See the related SEARCH CLASS notes in References to Other Classes, below.

Many classes contain subject matter which includes modulators or devices analogous to modulators as subcombinations thereof. Thus, as appropriate, combination classes listed below in the SEARCH CLASS notes in References to Other Classes, below, should be considered in completing the search of subject matter relevant to Class 332.

See the Glossary, below, for nonelectrical modulators.

MODULATORS OF NONELECTRICAL TYPE

The term modulator has a variety of meanings outside of the electrical art. Foremost among these are fluid control devices and optical control devices. Examples of fluid control type modulators and optical type modulators can be found in References to Other Classes, below.

Other diverse types of nonelectrical modulators can be found in References to Other Classes, below.

SECTION III - SUBCLASS REFERENCES TO THE CURRENT CLASS

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 118, for measuring in a frequency modulator.
- 150, for measuring in an amplitude modulator.

SECTION IV - REFERENCES TO OTHER CLASSES

SEE OR SEARCH CLASS:

- 60, Power Plants, appropriate subclasses for fluid control type modulators.
- 62, Refrigeration, appropriate subclasses for fluid control type modulators.
- 73, Measuring and Testing, appropriate subclasses for measuring or testing of a parameter which is typically neither electrical, optical, thermal, nor chemical and which may include a modulation technique.
- 137, Fluid Handling, appropriate subclasses for fluid control type modulators.
- 178, Telegraphy, subclasses 66.1+ for a telegraphic system which transmits messages between stations using alternating or pulsating currents and particularly subclass 66.2 for such a system having a transmitter which is turned on and off.
- 180, Motor Vehicles, appropriate subclasses for fluid control type modulators.
- 250, Radiant Energy, subclasses 200+ for a photocell-controlled modulator combined with a significant optical system for controlling the light intensity on the photocell, subclass 250 for radio and microwave wavemeters and frequency measurement systems for radio waves, subclass 263 for an electrical wave modulated by signals emitted from a radiation detector in or about a well, and subclasses 336.1+ for structure comparable to that of subclasses 200+ described above wherein the photocell is responsive to invisible radiant energy.
- 257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), appropriate subclasses for active semiconductor devices, per se.
- 264, Plastic and Nonmetallic Article Shaping or Treating: Processes, appropriate subclasses for diverse types of nonelectrical modulators.
- 303, Fluid-Pressure and Analogous Brake System, appropriate subclasses for fluid control type modulators.
- 307, Electrical Transmission or Interconnection Systems, subclass 3 for systems superimposing currents of diverse frequency or phase, subclass 73 for plural supply circuits or sources of diverse frequency, and subclasses 106+ for waveform or wave shape determinative or pulse producing systems which are class appropriate.
- 313, Electric Lamp and Discharge Devices, appropriate subclasses for the structure of electronic tubes.
- 315, Electrical Lamp and Discharge Devices: Systems, subclasses 3+ for a combination of cathode-ray tube with ray control structure which may utilize a modulation technique, subclass 39.3 for a travelling wave tube with delay line and subclasses 39.51+ for a magnetron combined with diverse circuit element.
- 318, Electricity: Motive Power Systems, subclass 599 for pulse width modulated power control of a servo motor, subclasses 606+ for servo systems utilizing a feedback signal which frequency or phase modulates a system carrier, subclass 684 for a particular modulator structure used in servomotor control, and subclass 811 for pulse width modulated time control of a pulse train supplied to the primary winding of an induction motor.
- 323, Electricity: Power Supply or Regulation Systems, appropriate subclasses for control of the magnitude or phase of current or voltage in a system comprising a single electrical source coupled to a single electrical load.
- 324, Electricity: Measuring and Testing, appropriate subclasses for measurement of electrical properties, in general, and particularly subclasses 76.39+ for frequency measurement of electrical waves, subclasses 76.77+ for measurement of the phase relationship between electrical waves, and subclass 118 for modulation of voltage or current to be measured onto a carrier combined with subsequent structure to recover a replica of the original voltage or current by demodulation.
- 327, Miscellaneous Active Electrical Nonlinear Devices, Circuits, and Systems, particularly subclasses 113+ for miscellaneous frequency control, subclasses 291+ for miscellaneous clock or pulse waveform generating, subclasses 231+ for phase shift by less than the period of an input signal, and subclasses 306+ for miscellaneous amplitude control.
- 329, Demodulators, appropriate subclasses for demodulators, per se.

- 330, Amplifiers, subclass 10, for an amplifier having an input which is the output of a modulator and an output which is the input of a subsequent demodulator, and subclasses 127+, 144+ and 250+ for an amplifier with gain control structure.
- 331, Oscillators, subclasses 1+ for automatic frequency stabilization of an oscillator and indented thereunder subclasses 23+ for achieving this stabilization through a modulation technique, subclasses 37+ for two nonarbitrary sources of slightly different frequencies and substantially equal amplitudes which are combined to produce the respective sum or difference frequencies, subclasses 46+ for plural oscillator systems in general, subclass 58 for an oscillator with structure to perform an additional simultaneous function, subclasses 65+ for an oscillator responsive to an external condition, subclass 83 for a klystron type oscillator, subclasses 86+ for a magnetron type oscillator, subclass 106 for an oscillator with repetitive amplitude variation, subclasses 177+ for an oscillator combined with frequency adjustment, and subclasses 182+ for amplitude stabilization or control in an oscillator.
- 333, Wave Transmission Lines and Networks, subclass 20 for passive networks which modify the amplitude-time characteristic of waves passing therethrough, and subclasses 219+ for resonators in general.
- 340, Communications: Electrical, subclasses 870.01+ for telemetry systems and especially subclasses 870.18+ indented thereunder for such systems where the quantity to be telemetered is imposed on a carrier by a particular type of modulation.
- 341, Coded Data Generation or Conversion, subclasses 126+ for a pulse code modulator, per se, and subclass 143 for a delta modulator, per se.
- 342, Communications: Directive Radio Wave Systems and Devices (e.g., Radar, Radio Navigation), appropriate subclasses for radar systems or subsystems utilizing devices (i.e., radar modulators) which vary the amplitude, frequency or phase of a radar signal in a nonarbitrary manner.
- 348, Television, subclass 472 for individual television signals combined into a specific transmission format by a pulse code modulated technique, subclass 642 for a natural color television signal generator including a modulator particularly adapted for use therein, and subclass 724 for a modulator using in television transmitter circuitry.
- 358, Facsimile and Static Presentation Processing, subclass 469 for facsimile circuitry including a modulator particularly adapted for use therein.
- 359, Optics; Systems (Including Communication and Elements), subclasses 237+ for light wave modulators; appropriate subclasses for optical type modulators.
- 360, Dynamic Magnetic Information Storage or Retrieval, subclasses 29+ for modulators of particular utility in dynamic magnetic recording or reproducing.
- 363, Electric Power Conversion Systems, subclass 26 for a DC-AC inverter having pulse width modulated automatic control of output current or voltage, and subclasses 41+ for a DC-AC inverter using a pulse modulation technique to introduce or eliminate frequency components.
- 367, Communications, Electrical: Acoustic Wave System and Devices, appropriate subclasses for diverse types of nonelectrical modulators.
- 369, Dynamic Information Storage or Retrieval, subclass 8 for a radio combined with an information retrieval device wherein an oscillator is controlled by a retrieved information signal, subclass 61 for direct storage or retrieval of a modulated carrier signal, subclass 62 for storage or retrieval involving a modulated signal wherein the carrier is partially or completely suppressed prior to storage and reinserted subsequent to retrieval, subclass 90 for storage of a quadrasonic signal utilizing modulation of an AC wave by at least one of the respective channels, and subclasses 127+ for mechanical modification or sensing of a storage medium which may utilize a modulation technique.
- 370, Multiplex Communications, appropriate subclasses which may have particular details of modulation techniques.
- 372, Coherent Light Generators, for optical type modulators.
- 374, Thermal Measuring and Testing, appropriate subclasses for measurement systems responsive to an external thermal condition which may utilize a modulation technique.
- 375, Pulse or Digital Communications, appropriate subclasses for subject matter of this class combined with transmitting structure to couple a modulated pulse wave to a transmission medium and subclasses 237 and 242+ for a digital communication transmitter or system utilizing pulse number modulation or pulse code modulation, respectively.

- 379, Telephonic Communications, subclasses 64+ for a telephone speech signal transmitter utilizing a carrier modulation technique, and subclasses 93+ (particularly subclass 98) for transmission of a digital message signal over a telephone line which may utilize a modulation technique.
- 380, Cryptography, for all electrical communications equipment which process an information signal for purposes of concealment and particularly subclasses 10+ for scrambling of a video signal using a modulation related technique, subclasses 31+ for cryptos:graphic electrical signal modification using a plural modulation technique, and subclass 35 for cryptos:graphic signal modification using a variable time delay modulation technique.
- 381, Electrical Audio Signal Processing Systems and Devices, subclasses 3+ for audio systems or devices which process a stereo signal which is transmitted in a frequency-only modulated format, subclasses 15+ for audio systems or devices which process a stereo signal which is transmitted in an amplitude modulated or both an AM and angle modulated format, and subclass 316 for control of the output amplitude of a hearing aid as a function of frequency.
- 386, Television Signal Processing for Dynamic Recording or Reproducing, subclasses 26+ for processing of a natural color television signal including frequency in modulation for recording on the same track.
- 430, Radiation Imagery Chemistry: Process, Composition, or Product Thereof, appropriate subclasses for diverse types of nonelectrical modulators.
- 432, Heating, appropriate subclasses for diverse types of nonelectrical modulators.
- 455, Telecommunications, appropriate subclasses for subject matter of this class combined with transmitting structure to couple the modulated carrier wave to a transmission medium.

SECTION V - GLOSSARY

ARBITRARILY VARYING

Indicates having a future value which is not predictable from past values. (Arbitrary is the opposite of repetitious).

CARRIER

Is an electrical or electromagnetic repetitious sinusoidal wave.

CHARACTERISTIC

Is an attribute associated with the size or shape of a wave or signal. Examples are amplitude, frequency, or phase of a sine wave and repetition rate, position, amplitude or width of a nonsine wave.

MODULATING SIGNAL

Is an information carrying signal whose informational content is to be impressed on a carrier or pulse wave.

MODULATOR

Is a device which varies a characteristic of a repetitious electrical or electromagnetic wave of less than infrared frequency in accordance with a characteristic of an arbitrarily varying modulating signal.

PULSE WAVE

Is an electrical or electromagnetic repetitious nonsinusoidal wave. Examples are square wave, saw-tooth wave, or trapezoidal wave.

REPETITIOUS WAVE

Is a cyclic wave whose individual component cycles are substantially identical. Examples of repetitious waves are sine waves, square waves, saw-tooth waves, and trapezoidal waves.

SUBCLASSES

100 FREQUENCY SHIFT KEYING MODULATOR OR MINIMUM SHIFT KEYING MODULATOR:

This subclass is indented under the class definition. Subject matter in which the frequency of the carrier is shifted among a plurality of discrete values in accordance with the modulating signal.

- (1) Note. This subclass and its indents provide for a minimum shift keying (MSK) modulator which is a frequency shift keying modulator having phase continuity at the frequency transition points.

- (2) Note. This subclass includes frequency shift keying modulators, per se. See the SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

103+, for a phase shift keying modulator.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclasses 272+ for a frequency shift keying system (i.e., transmitter and receiver), and subclasses 303+ for a frequency shift keying modulator combined with transmitting structure.

101 Including logic element (e.g., logic gate or flip-flop):

This subclass is indented under subclass 100. Subject matter containing a component which performs a Boolean Algebraic operation.

- (1) Note. Such components may be combinational or sequential (e.g., AND gates, OR gates or J-K flip-flops).

102 Including discrete semiconductor device:

This subclass is indented under subclass 100. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

103 PHASE SHIFT KEYING MODULATOR OR QUADRATURE AMPLITUDE MODULATOR:

This subclass is indented under the class definition. Subject matter in which the phase of the carrier is shifted among a plurality of discrete angles in accordance with the modulating signal.

- (1) Note. Also included here is the case where the phase and amplitude of the

carrier are simultaneously shifted among a plurality of discrete angle/magnitude pairs (i.e., QAM).

- (2) Note. This subclass includes phase shift keying modulators, or quadrature amplitude modulators, per se. See the SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

100+, for a frequency shift keying modulator.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclass 261 for a quadrature amplitude modulation system (i.e., transmitter and receiver), subclasses 279+ for a phase shift keying system, and subclass 308 for a phase shift keying modulator combined with transmitting structure.

104 Including logic element (e.g., logic gate or flip-flop):

This subclass is indented under subclass 103. Subject matter containing a component which performs a Boolean Algebraic operation.

- (1) Note. Such components may be combinational or sequential (e.g., AND gates, OR gates or J-K flip-flops).

105 Including discrete semiconductor device:

This subclass is indented under subclass 103. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

106 PULSE OR INTERRUPTED CONTINUOUS WAVE MODULATOR:

This subclass is indented under the class definition. Subject matter producing a final output signal consisting of a repetitious pulse wave or a pulsed continuous wave having one or more of its characteristics varied in accordance with one or more modulating signals.

- (1) Note. Examples of pulse waves are square waves, sawtooth waves, and trapezoidal waves.
- (2) Note. If a system includes a pulse modulator, but the final output signal is a frequency, phase or an amplitude modulated wave, the modulator is classified in subclasses 117+, 144+ or 149+, respectively.
- (3) Note. Systems having a final output that is pulse code modulated (PCM) or delta modulated are found in Class 341 subclasses 126+ or 143.
- (4) Note. This subclass includes pulse modulators, per se. See the SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 117+, for a frequency modulator.
- 144+, for a phase modulator.
- 149+, for an amplitude modulator.

SEE OR SEARCH CLASS:

- 375, Pulse or Digital Communications, appropriate subclasses, for combinations of a pulse modulator with transmitting structure.

107 Including stabilization or alternatively distortion, noise or other interference prevention, reduction, or compensation:

This subclass is indented under subclass 106. Subject matter including the neutralization of an undesirable characteristic of a pulse modulator or its signals.

- (1) Note. Distortion may be introduced to the pulse modulating system in order to compensate for other inherent distortion.

- (2) Note. The neutralized characteristic might be some form of system instability.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 123+, for distortion or noise control in a frequency modulator.
- 159+, for distortion or noise control in an amplitude modulator.

SEE OR SEARCH CLASS:

- 375, Pulse or Digital Communications, subclasses 254, 285 and 296 for noise or distortion control in a system or transmitter.

108 Plural modulation:

This subclass is indented under subclass 106. Subject matter having a plurality of modulators, modulating signals, or diverse output modulation types simultaneously present or individually selectable.

- (1) Note. At least one final output signal must be a pulse modulated signal for classification herein.
- (2) Note. Multiplex pulse modulators, per se, are classified here.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 119+, for plural modulation in a frequency modulator.
- 145, for plural modulation in a phase modulator.
- 151+, for plural modulation in an amplitude modulator.

SEE OR SEARCH CLASS:

- 370, Multiplex Communications, appropriate subclasses and particularly subclass 205 for combined pulse width and pulse position modulation, subclass 212 for a multiplex transmitter using pulse width modulation and subclass 213 for multiplex transmitter using pulse position modulation.

109 Pulse width modulator:

This subclass is indented under subclass 106. Subject matter producing a pulse wave output signal in which the pulse width (duration) is varied by the modulating signal.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclass 238 for a combination of pulse width modulator with transmitting structure.

110 Including discrete semiconductor device having three or more electrodes:

This subclass is indented under subclass 109. Subject matter utilizing a device with three external connection points where the constituent portions of the device are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

111 Including electron discharge device:

This subclass is indented under subclass 109. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.

112 Pulse position, frequency, phase or spacing modulator:

This subclass is indented under subclass 106. Subject matter producing a pulse wave output signal in which the relative positions of the pulses, the frequency (repetition rate) of the pulses, the phase of the pulses, or the spacing (time) between the pulses is varied by the modulating signal.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclass 239 for a combination of pulse position, frequency or spacing modulator with transmitting structure.

113 Including discrete semiconductor device having three or more electrodes:

This subclass is indented under subclass 112. Subject matter utilizing a device with three external connection points where the constituent portions of the device are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

114 Including electron discharge device:

This subclass is indented under subclass 112. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.

115 Pulse amplitude modulator:

This subclass is indented under subclass 106. Subject matter producing a pulse wave output signal in which the amplitude of the pulses is controlled by the modulating signal.

SEE OR SEARCH CLASS:

375, Pulse or Digital Communications, subclasses 300+ for a combination of pulse amplitude modulator with transmitting structure, and subclasses 268+ for a pulse amplitude modulation system (i.e., transmitter and receiver).

116 Including discrete semiconductor device having three or more electrodes:

This subclass is indented under subclass 115. Subject matter utilizing a device with three external connection points where the constituent portions of the device are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

117 FREQUENCY MODULATOR:

This subclass is indented under the class definition. Subject matter in which the frequency of the carrier is varied over a continuum of values in accordance with the modulating signal.

- (1) Note. This subclass includes frequency modulators, per se. See the SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 106+, for a pulse modulator.
144+, for a phase modulator.
149+, for an amplitude modulator.

SEE OR SEARCH CLASS:

- 455, Telecommunications, subclasses 42+ for frequency modulation in a system with separated transmitter and receiver, and subclasses 110+ for a combination of frequency modulator with transmitting structure.

118 Including measuring or indicating:

This subclass is indented under subclass 117. Subject matter combined with apparatus producing a qualitative or quantitative output representative of a characteristic of the modulator or its signals.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 150, for measuring in an amplitude modulator.

SEE OR SEARCH CLASS:

- 331, Oscillators, subclass 64 for an oscillator with indicator.
455, Telecommunications, subclasses 67.11 through 67.7, for measuring or testing in a system with separated transmitter and receiver and subclasses 115.1-115.4 for measuring or testing of a telecommunications transmitter.

119 Plural modulation:

This subclass is indented under subclass 117. Subject matter having a plurality of modulators, modulating signals, or diverse output modulation types simultaneously present or individually selectable.

- (1) Note. At least one final output signal must be a frequency modulated signal.
(2) Note. Multiplex frequency modulators, per se, are classified here.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 108, for plural modulation in a pulse modulator.
145, for plural modulation in a phase modulator.
151+, for plural modulation in an amplitude modulator.

SEE OR SEARCH CLASS:

- 370, Multiplex Communications, appropriate subclasses and particularly subclasses 204+ for plural diverse modulation techniques, subclass 215 for multiplex transmitter using phase modulation and subclass 483 for a multiplex transmitter using frequency modulation.
455, Telecommunications, subclass 61 for plural modulation where a single message is conveyed between a separated transmitter and receiver and subclass 102 for plural modulation in a telecommunications transmitter.

120 Including amplitude modulation:

This subclass is indented under subclass 119. Subject matter in which at least one modulator is an amplitude modulator or in which ampli-

tude modulation is produced in addition to the frequency modulation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

145, for a phase modulator which includes an amplitude modulator.

121 Including electron discharge device:

This subclass is indented under subclass 120. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

(1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.

(2) Note. Additional control electrodes may be present.

122 Including electron discharge device:

This subclass is indented under subclass 119. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

(1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.

(2) Note. Additional control electrodes may be present.

123 Including stabilization or alternatively distortion, noise or other interference prevention, reduction or compensation:

This subclass is indented under subclass 117. Subject matter including the neutralization of an undesirable characteristic of a frequency modulator or its signals.

(1) Note. In some instances, distortion may be introduced to the FM system in order to compensate for other inherent distortion.

(2) Note. The neutralized characteristic might be some form of system instability.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

107, for distortion or noise control in a pulse modulator.

159+, for distortion or noise control in an amplitude modulator.

SEE OR SEARCH CLASS:

455, Telecommunications, subclasses 63.1 through 65 and subclasses 501-506 for noise control in a telecommunication system with separated transmitter and receiver, and subclasses 114.1-114.3 for harmonic radiation control in a transmitter.

124 Nonlinearity reduction or compensation:

This subclass is indented under subclass 123. Subject matter which diminishes the undesired effects of a modulator element or circuit whose output is not directly proportional to its input.

125 Automatic amplitude stabilization or control:

This subclass is indented under subclass 123. Subject matter where undesired signal amplitude variations are controlled without human intervention.

(1) Note. This might include, for example, suppression of undesired amplitude modulation.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

155+, for amplitude control in an amplitude modulator.

SEE OR SEARCH CLASS:

455, Telecommunications, subclass 116 for control of carrier amplitude in a transmitter.

126 Automatic frequency stabilization or control:

This subclass is indented under subclass 123. Subject matter in which undesired signal frequency variations are controlled without human intervention.

(1) Note. Often the frequency being controlled is that of the unmodulated carrier.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

161, for frequency control in an amplitude modulator.

SEE OR SEARCH CLASS:

331, Oscillators, subclasses 1+ for automatic frequency control of an oscillator.

455, Telecommunications, subclasses 75+ for frequency stabilization in a transceiver, subclass 113 for frequency control of a frequency modulated transmitter and subclass 119 for stabilizing the carrier frequency in a telecommunications transmitter.

127 Phase or frequency locked loop:

This subclass is indented under subclass 126. Subject matter in which a stable frequency is attained by utilizing a phase or frequency locked loop.

128 Modulating signal applied to plural elements of the loop:

This subclass is indented under subclass 127. Subject matter in which the modulating signal is injected into a plurality of points within the locked loop.

129 Including microwave or distributed parameter structure:

This subclass is indented under subclass 117. Subject matter utilizing a structure or device which is peculiar to microwave frequencies or which has resistance, inductance or capacitance not concentrated in lumped circuit elements.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

163+, for similar structure in an amplitude modulator.

SEE OR SEARCH CLASS:

455, Telecommunications, subclass 111, for distributed parameter structure in a frequency modulated transmitter.

130 With discrete semiconductor device:

This subclass is indented under subclass 129. Subject matter containing an electrical device whose constituent portions are constructed

from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

(1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

131 With electron discharge device:

This subclass is indented under subclass 129. Subject matter combined with a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

(1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.

(2) Note. Additional control electrodes may be present.

132 Magnetron type:

This subclass is indented under subclass 131. Subject matter in which an electron beam within the discharge device is subject to a magnetic field.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 5.13 and 39.51+ for a magnetron combined with diverse circuit element.

331, Oscillators, subclass 5 for automatic frequency control of a magnetron oscillator and subclasses 86+ for a magnetron oscillator, per se.

133 Klystron type:

This subclass is indented under subclass 131. Subject matter where the discharge device includes structure to vary the relative velocity of different longitudinal portions of the electron beam resulting in electron bunching.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 5+ for a cathode-ray tube circuit where the ray traverses a hollow distributed parameter device and particularly indented thereunder subclasses 5.21+, 5.46+ and 5.53+ for tuning thereof.

- 331, Oscillators, subclasses 6+ for automatic frequency control in a klystron oscillator and subclass 83 for a klystron oscillator, per se.
- 134 Travelling wave type:**
This subclass is indented under subclass 131. Subject matter wherein the discharge device has structure to slow a travelling electromagnetic wave to more closely match the velocity of an electron beam with which it is interacting.
- SEE OR SEARCH CLASS:
315, Electric Lamp and Discharge Devices: Systems, subclasses 3.5+ for travelling wave tube combined with a delay transmission line.
331, Oscillators, subclass 82 for a travelling wave-tube type oscillator.
- 135 Including discrete semiconductor device:**
This subclass is indented under subclass 117. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.
- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.
- 136 With varactor:**
This subclass is indented under subclass 135. Subject matter in combination with a variable capacitance diode.
- SEE OR SEARCH CLASS:
257, Active Solid-State Devices (e.g., Transistors, Solid-State Diodes), subclasses 312, 480, and 595-602 for voltage variable capacitive type active semiconductor devices.
- 137 Including electron discharge device:**
This subclass is indented under subclass 117. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.
- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.
- 138 Particular oscillator circuit:**
This subclass is indented under subclass 137. Subject matter including details of an associated frequency source.
- (1) Note. Mere mention of an oscillator exclusive of detail is insufficient for classification herein.
- SEE OR SEARCH CLASS:
331, Oscillators, appropriate subclasses, for an oscillator, per se.
- 139 Crystal oscillator type:**
This subclass is indented under subclass 138. Subject matter in which frequency generation is controlled by a crystal resonator such as a piezoelectric crystal.
- SEE OR SEARCH CLASS:
331, Oscillators, subclasses 73, 116, 139, and 154+ for piezoelectric-type oscillators.
- 140 With separate modulator tube (e.g., reactance tube):**
This subclass is indented under subclass 139. Subject matter where an electron discharge device distinct from the crystal oscillator performs the actual modulation.
- 141 L-C oscillator type:**
This subclass is indented under subclass 138. Subject matter in which frequency generation is accomplished by an inductive-capacitive network.
- 142 With separate modulator tube (e.g., reactance tube):**
This subclass is indented under subclass 141. Subject matter where an electron discharge device distinct from the L-C oscillator performs the actual modulation.

143 Plural Modulator Tubes:

This subclass is indented under subclass 142. Subject matter having a plurality of such distinct modulator tubes.

144 PHASE MODULATOR:

This subclass is indented under the class definition. Subject matter in which the phase of the carrier is varied over a continuum of values in accordance with the modulating signal.

- (1) Note. This subclass includes phase modulators, per se. See SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 106+, for a pulse modulator.
117+, for a frequency modulator.
149+, for an amplitude modulator.

SEE OR SEARCH CLASS:

- 455, Telecommunications, subclasses 42+ for phase modulation in a system with separated transmitter and receiver, and subclasses 110+ for a combination of a phase modulator with transmitting structure.

145 Including amplitude modulator:

This subclass is indented under subclass 144. Subject matter in which at least one modulator is an amplitude modulator or in which amplitude modulation is produced in addition to phase modulation.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 108, for plural modulation in a pulse modulator.
119+, for plural modulation in a frequency modulator.
151+, for plural modulation in an amplitude modulator.

SEE OR SEARCH CLASS:

- 370, Multiplex Communications, appropriate subclasses and particularly subclasses 204+ for plural diverse modulation techniques, subclass 215 for a multiplexer using phase modulation, subclass 483 for a multiplexer using

frequency modulation, subclass 533 for a multiplexer using pulse amplitude modulation.

- 455, Telecommunications, subclass 61 for plural modulation where a single message is conveyed between a separated transmitter and receiver and subclass 102 for plural modulation in a telecommunications transmitter.

146 Including discrete semiconductor device:

This subclass is indented under subclass 144. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

147 Including electron discharge device:

This subclass is indented under subclass 144. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
(2) Note. Additional control electrodes may be present.

148 Push-pull circuit:

This subclass is indented under subclass 147. Subject matter wherein there are two electrical paths with common output each of which contains an electron discharge device and in which the respective voltages are 180° out of phase with respect to the other.

149 AMPLITUDE MODULATOR:

This subclass is indented under the class definition. Subject matter in which the amplitude of the carrier is varied over a continuum of values in accordance with the modulating signal.

- (1) Note. If a system includes an amplitude modulator, but the final output signal is a pulse modulated, frequency modulated

or phase modulated wave, the modulator is classified in subclasses 106+, 117+ or 144+, respectively.

- (2) Note. This subclass includes amplitude modulators, per se. See the SEARCH CLASS notes below for combinations with the subject matter of this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

106+, for a pulse modulator.
117+, for a frequency modulator.
144+, for a phase modulator.

SEE OR SEARCH CLASS:

455, Telecommunications, subclasses 108+ , for amplitude modulation in a telecommunications transmitter.

150 Including measuring or indicating:

This subclass is indented under subclass 149. Subject matter combined with apparatus producing a qualitative or quantitative output representative of a characteristic of the modulator or its signals.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

118, for measuring in a frequency modulator.

SEE OR SEARCH CLASS:

331, Oscillators, subclass 64 for an oscillator with indicator.
455, Telecommunications, subclasses 67.11 through 67.7, for measuring or testing in a system with separated transmitter and receiver and subclasses 115.1-115.4 for measuring or testing of a telecommunications transmitter.

151 Plural modulation:

This subclass is indented under subclass 149. Subject matter having a plurality of modulators, modulating signals, or diverse output modulation types simultaneously present or individually selectable.

- (1) Note. At least one final output signal must be an amplitude modulated carrier wave.

- (2) Note. Multiplex amplitude modulators, per se, are classified here.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

108, for plural modulation in a pulse modulator.
119+, for plural modulation in a frequency modulator.
145, for plural modulation in a phase modulator.

SEE OR SEARCH CLASS:

370, Multiplex Communications, appropriate subclasses and particularly subclasses 204+ for plural diverse modulation techniques, and subclass 533 for a multiplexer using pulse amplitude modulation.
455, Telecommunications, subclass 61 for plural modulation where a single message is conveyed between a separated transmitter and receiver and subclass 102 for plural modulation in a telecommunications transmitter.

152 Including discrete semiconductor device:

This subclass is indented under subclass 151. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

153 Including electron discharge device:

This subclass is indented under subclass 151. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.

- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
(2) Note. Additional control electrodes may be present.

- 154 Push-pull circuit:**
This subclass is indented under subclass 153. Subject matter wherein there are two electrical paths with common output each of which contains an electron discharge device and in which the respective voltages are 180 degrees out of phase with respect to the other.
- 155 Percent modulation control or automatic amplitude control of carrier or modulating signal:**
This subclass is indented under subclass 149. Subject matter in which amplitude control is exerted on the carrier, the modulating signal, or the ratio therebetween without human intervention.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
125, for amplitude control in a frequency modulator.
- SEE OR SEARCH CLASS:
331, Oscillators, subclasses 109 and 182+ for an oscillator with amplitude control.
455, Telecommunications, subclass 116 for control of carrier amplitude in a transmitter.
- 156 Over modulation prevention:**
This subclass is indented under subclass 155. Subject matter in which the automatic amplitude control maintains the ratio of the modulating signal amplitude to the carrier signal amplitude at a value of one or less.
- 157 Average carrier amplitude controlled by modulating signal:**
This subclass is indented under subclass 155. Subject matter in which the average unmodulated carrier amplitude is adjusted to reflect the average modulating signal amplitude.
- 158 Carrier output suppressed during absence of modulating signal:**
This subclass is indented under subclass 155. Subject matter in which the automatic control eliminates the carrier in response to a lack of modulating signal.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
167+, for a suppressed carrier, double side-band amplitude modulator.
- SEE OR SEARCH CLASS:
455, Telecommunications, subclass 116 for carrier amplitude control in a telecommunications transmitter.
- 159 Including stabilization or alternatively distortion, noise, or other interference prevention, reduction or compensation:**
This subclass is indented under subclass 149. Subject matter including the neutralization of an undesirable characteristic of an amplitude modulator or its signals.
- (1) Note. In some instances, distortion may be introduced to the AM system in order to compensate for other inherent distortion.
- (2) Note. The neutralized characteristic might be some form of system instability.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:
107, for distortion or noise control in a pulse modulator.
123+, for distortion or noise control in a frequency modulator.
- SEE OR SEARCH CLASS:
455, Telecommunications, subclasses 63.1 through 65 and subclasses 501-506 for noise control in a telecommunication system with separated transmitter and receiver, and subclasses 114.1-114.3 for harmonic radiation control in a transmitter.
- 160 Reduction or compensation of nonlinearity in modulation characteristic:**
This subclass is indented under subclass 159. Subject matter which diminishes the undesired effects of a modulator element or circuit whose output is not directly proportional to its input.

161 Reduction of carrier phase or frequency variations or modulation:

This subclass is indented under subclass 159. Subject matter in which undesired fluctuations of either the phase or frequency of the carrier are reduced.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

126+, for frequency control in a frequency modulator.

SEE OR SEARCH CLASS:

455, Telecommunications, subclasses 75+ for frequency stabilization in a transceiver, subclass 113 for frequency control of a frequency modulated transmitter and subclass 119 for stabilizing the carrier frequency in a telecommunications transmitter.

162 Using feedback to reduce distortion, noise, or other interference:

This subclass is indented under subclass 159. Subject matter in which a feedback signal is used to remove or control distortion.

163 Including microwave or distributed parameter structure:

This subclass is indented under subclass 149. Subject matter utilizing a structure or device which is peculiar to microwave frequencies or which has resistance, inductance or capacitance not concentrated in lumped circuit elements.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

129+, for similar structure in a frequency modulator.

164 With discrete semiconductor device:

This subclass is indented under subclass 163. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.

(1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.

165 With electron discharge device:

This subclass is indented under subclass 163. Subject matter combined with a device which has electrical current flow between two spaced electrodes in a gas, vapor, or vacuum.

(1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.

(2) Note. Additional control electrodes may be present.

166 Magnetron type:

This subclass is indented under subclass 165. Subject matter in which an electron beam within the discharge device is subject to a magnetic field.

SEE OR SEARCH CLASS:

315, Electric Lamp and Discharge Devices: Systems, subclasses 5.13 and 39.51+ for a magnetron combined with diverse circuit element.

331, Oscillators, subclass 5 for automatic frequency control in a magnetron oscillator and subclasses 86+ for a magnetron oscillator, per se.

167 Suppressed carrier double sideband type:

This subclass is indented under subclass 149. Subject matter in which the carrier is suppressed continuously or intermittently and both sidebands are intact.

SEE OR SEARCH CLASS:

455, Telecommunications, subclass 46 for a suppressed carrier system having separated transmitter and receiver and subclass 109 for a suppressed carrier amplitude modulated transmitter.

168 Including discrete semiconductor device:

This subclass is indented under subclass 167. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically

- modified through the addition of small amounts dopant.
- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.
- 169 Including electron discharge device:**
This subclass is indented under subclass 167. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.
- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.
- 170 Single or vestigial sideband type:**
This subclass is indented under subclass 149. Subject matter in which the final output contains less than two complete sidebands with or without the carrier.
- SEE OR SEARCH CLASS:
455, Telecommunications, subclass 47 for a single or vestigial sideband system with separated transmitter and receiver and subclass 109 for a single or vestigial sideband amplitude modulated transmitter.
- 171 Including electron discharge device:**
This subclass is indented under subclass 170. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.
- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.
- 172 Modulating signal applied to a bridge circuit:**
This subclass is indented under subclass 149. Subject matter in which the carrier is applied to an impedance bridge in which the impedance of at least one branch is varied in accordance with the modulating signal.
- 173 Magnetic field varied by modulating signal:**
This subclass is indented under subclass 149. Subject matter in which the amplitude of the carrier is varied by varying a magnetic field in accordance with the modulating signal.
- (1) Note. Devices which may be used to vary a magnetic field include saturable reactors and transformers.
- 174 Resistive or dissipative device controlled by modulating signal (e.g., loss modulator):**
This subclass is indented under subclass 149. Subject matter in which the energy of the carrier is variably absorbed, diverted or scattered in accordance with the modulating signal.
- SEE OR SEARCH CLASS:
455, Telecommunications, subclass 106 for a transmitter utilizing absorption modulation.
- 175 Variable reactance controlled by modulating signal:**
This subclass is indented under subclass 149. Subject matter in which the amplitude of the carrier is varied by varying a reactance in accordance with the modulating signal.
- (1) Note. The variable reactance might be part of a tuning circuit, variation of which may be used to vary the gain of a circuit and thereby the amplitude of the carrier.
- 176 Nonlinear device controlled by modulating signal:**
This subclass is indented under subclass 149. Subject matter which includes a circuit element having an impedance which is not directly proportional to the current passing through it or the voltage applied to it and which controls the amplitude of the carrier in accordance with the modulating signal.
- (1) Note. Examples of nonlinear devices could be diodes, nonlinear crystals, thyrite resistors, or electronic tubes.
- 177 Nonlinear discrete semiconductor device:**
This subclass is indented under subclass 176. Subject matter in which the controlled circuit element is an electrical device whose constitu-

- ent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.
- 178 Including discrete semiconductor device:**
This subclass is indented under subclass 149. Subject matter containing an electrical device whose constituent portions are constructed from solid material having room temperature conductivity between that of a conductor and an insulator and which conductivity is typically modified through the addition of small amounts of dopant.
- (1) Note. This might include, for example, semiconductor diodes or transistors of diverse type.
- 179 Including electron discharge device:**
This subclass is indented under subclass 149. Subject matter utilizing a device which has electrical current flow between two spaced electrodes in a gas, vapor or vacuum.
- (1) Note. This might include, for example, vacuum or gas tubes such as diodes, triodes or pentodes.
- (2) Note. Additional control electrodes may be present.
- 180 Push-pull circuit:**
This subclass is indented under subclass 179. Subject matter wherein there are two electrical paths with common output each of which contains an electron discharge device and in which the respective voltages are 180 degrees out of phase with respect to the other.
- 181 Plate circuit modulation:**
This subclass is indented under subclass 179. Subject matter including an electronic tube which generates or amplifies the carrier, and in which the modulating signal is applied to the anode circuit of the tube or controls a circuit element in the anode circuit.
- (1) Note. This subclass includes circuits in which a variable voltage under control of the modulating signal is added to the anode supply voltage.
- 182 Grid circuit modulation:**
This subclass is indented under subclass 179. Subject matter including an electronic tube which generates or amplifies the carrier, and in which the modulating signal is applied to the grid circuit of the tube or controls a circuit element in the grid circuit.
- 183 MODULATION CONVERTER HAVING PRE-MODULATED INPUT (E.G., FM TO AM):**
This subclass is indented under the class definition. Subject matter in which the input to a system is a repetitious electrical wave which has had a characteristic varied in accordance with a modulating signal, and in which the output of the system is a repetitious electrical wave having a different characteristic varied.
- (1) Note. This subclass excludes systems whose outputs are pulse code modulated (PCM) or delta modulated. Such systems are found in Class 341 subclasses 126+ and 143.
- (2) Note. This subclass excludes systems having a plurality of diverse type modulators wherein the input of a first modulator is an intelligence and the output of this modulator forms the input of a second modulator whose output is a different form of modulation from its input. Such systems are found in subclasses 108, 119+, 145, and 151+, where the final output is pulse, frequency, phase or amplitude modulated, respectively.
- (3) Note. The combination of subject matter of this subclass with a subsequent demodulator is classified in Class 329.
- SEE OR SEARCH CLASS:
455, Telecommunications, appropriate subclasses, for diverse-type conversion in a telecommunication transmitter or receiver.
- 184 Between diverse pulse modulation types:**
This subclass is indented under subclass 183. Subject matter in which conversion occurs between diverse types of pulse modulation.

- (1) Note. This might include, for example, a pulse amplitude modulation to pulse width modulation converter.

185 MISCELLANEOUS:

This subclass is indented under the class definition. Subject matter not provided for in any of the preceding subclasses.

END